Guidance for Qualitative Project Level "Hot Spot" Analysis in PM-10 Nonattainment and Maintenance Areas

Federal Highway Administration
Office of Natural Environment

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Summary of Guidance

This guidance, developed in coordination with EPA, attempts to fill a gap in the understanding of what analysis is required under the law and current regulation relating to particulate matter (PM) pollution from transportation sources.

It is general in nature in the form of questions and answers which address many commonly asked questions about PM. Individual areas will have their own needs and should consult with Federal, State, or local agencies that can provide them with more detailed information about transportation sources of PM and its mitigation.

The first section addresses many procedural issues such as what requirements must be met, what are the different agencies involved in PM conformity determinations and their roles, when must the analysis be performed, and other information necessary to perform a PM analysis. This document indicates that there are many agencies involved in the evaluation of PM air quality issues. The analyst needs to coordinate efforts with the other agencies having similar responsibilities.

Attached to this guidance in an appendix are several examples of qualitative PM analysis. These examples demonstrate different levels of inquiry that may be used to qualitatively consider the impacts of various projects on PM-10 levels in a given area. These examples are not the only ones available. They simply provide an overview of some relevant factors in a qualitative analysis and how they might be used.

As noted above, this guidance is not definitive for any project but guidance for all projects. This must be considered as one reads this and applies it to their location. Additional assistance is available from State and local agencies, EPA, and FHWA Resource Centers and the Headquarter's Offices.

Questions and Answers

What are the analytical requirements for assessing the impacts of projects in PM-10 nonattainment and maintenance areas?

Section 93.116 of the transportation conformity rule states that any project-level conformity determination in a PM-10 nonattainment or maintenance area (see Figure 1) must document that no new local PM-10 violations will be created and the severity or number of existing violations will not be increased as a result of the project. Since EPA has not released modeling guidance on how to perform quantitative PM-10 hot-spot analysis, such quantitative analysis **is not currently required** (40 CFR 93.123(b)(4)). However, if a quantitative analysis is not done, the demonstration required by 40 CFR 93.116 must be based on a qualitative consideration of local factors (40 CFR 93.123(b)(2)).

A reasoned and logical explanation of why a hot spot will not be created or worsened is to be provided for project-level conformity determinations. This guidance provides examples of how to develop a hot-spot analysis, but other methods would also be acceptable. The interagency consultation process must be used to evaluate and decide on the methods and assumptions for conducting hot-spot analysis (40 CFR 93.105(c)(1)(i)).

What projects are subject to PM-10 qualitative hot-spot analysis?

A transportation project is subject to PM-10 hot-spot qualitative analysis requirements if it is:

- within a PM-10 nonattainment or maintenance area;
- funded or approved by FHWA or FTA;
- is not a project covered by sections 93.126 and 93.128 of the transportation conformity rule; and
- a quantitative analysis has not been performed.[1]

Interagency consultation must be undertaken to identify which projects require PM-10 qualitative hot spot analyses.

[1]The conformity rule does not require quantitative analyses. However, if an area has conducted a quantitative analysis, a qualitative analysis does not need to be done.

What are the roles and responsibilities of different agencies in project-level conformity determinations?

Roles and responsibilities of different agencies for meeting the transportation conformity requirements are addressed in either 40 CFR 93.105 of the Federal conformity rule or in a State's EPA-approved Conformity State Implementation Plan (SIP). In general, the following agencies have these responsibilities in implementing the PM-10 hot-spot analysis requirement.

1. Project Sponsor - The project sponsor is the agency responsible for implementing the project. Typically, the project sponsor is a local government, transit operator, metropolitan planning organization, or State department of transportation. The project sponsor is responsible for providing the PM-10 qualitative analysis addressed in this guidance and meeting consultation requirements described in 40 CFR 93.105 or the approved Conformity SIP. Consultation with State and/or local agencies is critical to completing qualitative hot-spot analyses. The project sponsor, in cooperation with the Federal Agency, also is responsible for conducting the environmental analysis and review to comply with the National Environmental Policy Act (NEPA) of 1969 as required by the CEQ regulations (40 CFR 1500-1508) and the FHWA/FTA project development requirements (23 CFR Part 771).

2. FHWA/FTA - FHWA and FTA are jointly responsible for determining that the requirements of the Transportation Conformity Rule are met. The determination of whether the PM-10 project level qualitative analysis requirements have been met generally occurs through the interagency consultation process. Documents prepared to meet the requirements of NEPA (40 CFR 1500-1508) and 23 CFR Part 771 are used to demonstrate that the analysis has been appropriately conducted. These documents may include Environmental Impact Statements (EISs) with Records of Decision (RODs) and Environmental Assessments (EAs) with Findings of No Significant Impacts (FONSI). The analysis may be appropriate for Categorical Exclusions (CEs) determinations. It is the responsibility of FHWA/FTA to review and approve EISs, RODs EAs, FONSIs, and CEs for certain actions.

3. EPA - EPA plays an advisory role in the conformity determination process. As a matter of course, FHWA/FTA consult with EPA before making a final conformity determination.

What analysis years should be used in hot-spot analyses?

In the preamble of an amendment to the conformity rule published April 10, 2000, EPA clarifies its policy concerning the horizon years to be used in a hot-spot analysis (65 FR 18914). As discussed in that rulemaking, the transportation conformity rule provides areas with flexibility to decide how to demonstrate that hot-spots are not caused or worsened in an area through the interagency consultation process, as appropriate to the individual area, on a case-by-case basis.

Although most areas conduct hot-spot analyses for the year of project completion, many areas also examine other analysis years in the future. For example, some areas may analyze the last year of a currently conforming transportation plan, or another year within the timeframe of that plan, whichever year emissions are expected to be the highest. In any case, the hot-spot analysis should examine the year in which peak emissions in the project area are expected, which may not necessarily be the last year of the conforming plan. For more discussion on this issue, see the preamble to the April 10, 2000, final rule (65 FR 18914).

What are the criteria for meeting project level hot-spot analysis?

The conformity rule specifies that FHWA/FTA-funded or approved projects in PM-10 nonattainment and maintenance areas must not cause or contribute to any new localized PM-10 violations or increase the frequency or severity of any existing PM-10 violations within the project's area. The hot-spot analysis is intended to assess possible violations due to the project in combination with changes in the background levels over time. If there are no current exceedances or violations in the area affected by the project, the project's future effect is compared to the standard since the test is whether the project causes a new violation (i.e., the project's effect causes an exceedance of the standard). If there are current violations or exceedances in the area affected by the project, the project cannot worsen an existing violation, so a qualitative no-build/build comparison is required at a minimum.

Hot-spot analyses must include the entire project and may be performed only after the project's major design features have been identified. Preferred project alternatives must be compared to a no-build alternative in either a conceptual or more technically rigorous way. In performing the hot spot analysis, the design concept and scope of the project must be consistent to that included in the transportation plan and transportation improvement program. Any significant change in project design or scope will require a reevaluation of regional emissions and a new qualitative hot-spot analysis. However, if there are no localized violations, and if there would not be any violations within the project area, the project clearly satisfies this criterion.

Hot-spot analyses are not required to consider temporary increases in emissions caused by construction related activities that last 5 years or less at any individual site (40 CFR 93.123 (c)(5)).

What is the definition of a new violation?

The consultation process should be used to determine if new violations are anticipated under the hot-spot analyses. As implied, a new violation is one where concentration levels are expected to be higher than the PM-10 standard in a localized area that has not previously demonstrated such levels. It can and should be distinguishable from an exceedance registered by an existing, nearby monitor that is not caused by the project. As discussed in the preamble to the November 24, 1993, conformity rule, "EPA believes that a seemingly new violation may be considered to be a

relocation and reduction of an existing violation only if it were in the areas substantially affected by the project and if the predicted design value for the new site would be less than the design value at the 'old' site without the project, i.e., a net air quality benefit." (58 FR 62213).

What are some of the factors to consider in describing existing conditions?

An accurate description of existing conditions and factors that may influence PM-10 levels in the area affected by the proposed project should be provided. Analysis of those conditions, and how they are projected to change over time with the addition of the proposed project is the basis of the project-level conformity determination. Factors to be considered include:

1. Area affected by the proposed project. Describe the geographic area and general air quality conditions that could be influenced by the project, focusing specifically on PM-10 levels.

2. Existing Conditions. While the following list is not intended to be exhaustive or prescriptive, factors that are relevant to PM-10 levels may include:

   A. Air Quality. Determine if a monitoring station is near the project that will provide data on local air quality conditions, including PM-10 emissions. Also, consider reviewing data from monitoring stations located in other areas that may have similar traffic or environmental conditions.

   Source:
   (i): State/local areas similar to the project area. This review may be useful to evaluate and better understand the effects of the project.

   (ii): Monitoring data and modeling results included in SIP and more recent monitoring data from State/local air agencies; State/local public health departments.

   B. Transportation and traffic conditions. Address modes, volumes, speed, congestion, trends, etc. When the project analysis is incorporated in a NEPA document, this description should largely reference other sections of the NEPA document that address traffic and transportation issues in greater depth. A brief summary description of transportation and traffic conditions may be appropriate.

   Source: Project sponsor and observation.

   C. Built and natural environment, as they relate to PM-10. This description would include whether the character of the area is urban or rural, and whether adjacent buildings or topography create barriers to dispersal of PM-10. Relevant development trends and land use patterns should be addressed if they have a bearing on potential PM emissions from the project.

   Source: Project sponsor, local planning agency, and observation.

D. Meteorology, climate and seasonal data relevant to PM-10 emissions. Address whether the area experiences atmospheric "inversions," prevailing wind direction and speed, and amount of seasonal rainfall which have an impact on the prevalence of PM concentrations.

Source: State/local air quality agencies; National Weather Service.

E. Transportation control measures (TCMs) or adopted emission control programs in the project area that may mitigate any potential increase in PM emissions or that may be affected by the proposed project. The impact of national rules and regulations that EPA has promulgated, such as heavy-duty diesel rules, that are currently being implemented should also be considered.

Source: State or local air agency, EPA; review the applicable PM-10 SIP.

F. Other factors as appropriate.

What factors may be considered in describing "future" scenarios for projects?

The following factors may be used to describe the "future" scenarios[2]. These factors will change in the future, including the design year for the project, and whether these would expect to result in increases or decreases in PM-10 levels. Examples of factors that may lead to changes in PM-10 levels in the project area include:

- increased traffic volumes (relate changes in vehicle miles traveled (VMT) to changes in PM-10, particularly for diesel vehicles, trucks, buses, cars, etc.);
- street sanding/sweeping practices;
- changes in diesel truck or bus routes;
- major construction projects in the area affected by the project; and
- changes in the built and natural environment which may change current PM-10 dispersal patterns.

Each future build scenarios should consider whether the project would be expected to increase or decrease PM-10 concentration levels in the project area. This analysis should address whether the build alternative(s) would be expected to result in an exceedance of the PM-10 standard, or affect existing violations. As noted before, the temporary increase in emissions resulting from construction related activities of the proposed project that last 5 years or less does not need to be considered in the hot-spot analysis.

[2] Future scenarios include "Future Without the Project" (the "No-Build Alternative") and "Future With the Project" ("Build Alternative(s))"

What are the possible measures to mitigate an increase in PM-10 concentrations?

Where the project may lead to an increase in PM-10 levels, measures to mitigate these impacts should be addressed. In these cases, written commitments for project-level mitigation or control measures must be obtained from the project sponsor and/or operator prior to making a project-level conformity determination (40 CFR 93.125(a)). Options to reduce localized PM-10 emissions are included in the Appendix.

APPENDIX

EXAMPLES OF QUALITATIVE ANALYSIS METHODOLOGIES AND OTHER ESTIMATION TECHNIQUES

Examples of Qualitative Analysis Techniques

There are several approaches to qualitative analysis that can be used to meet the requirements of the conformity rule, the most common of which are described below. These approaches vary from a simple summary statement to more detailed analyses. The approach should be decided through consultation with all parties involved in the preparation of the analysis document, and also will be affected by the data and other resources available to the agency responsible for performing the analysis.

Information Potentially Relevant to Qualitative Analysis

As discussed, the interagency consultation process is used to determine the approach and depth of the qualitative analysis, and the outcome of that consultation should be documented. A meeting of the agencies that participate in the conformity finding including Federal, State, and local agencies should be held to discuss the best approach for any given project. It is likely that one approach may be used for one project while another approach may be more appropriate for a different project.

All analyses conducted should contain similar information regardless of the approach selected, including the project description, the factors that will influence the air quality (influence factors), and any programs that can be implemented to reduce emissions (mitigation practices) from the project.

1. Project Description

The qualitative analysis should begin with (or reference in the appropriate section of the NEPA document) a brief description of the project including where it is located (rural, urban, suburban) and the project's scope (adding an interchange, widening a highway, changing signal timing, etc.).

2. Influence Factors

The "influence factors" are those elements that may influence the quality of the air near the project and can generally be categorized into the areas listed below. These are not the only factors that can influence the air quality near a project, however, these may be among the most critical elements. Elaboration of these influence factors is discussed in the following paragraphs.

A. Statement of existing air quality

Existing air quality should be included to establish the probability of air quality problems from the project. Developers and reviewers of the analysis study should be aware of the existing conditions so that they can understand the relative impact that the project is

likely to have. It may be appropriate to cite published information regarding regional or local trend data on PM-10 concentrations, when such data is available and relevant to the project.

B. Traffic associated with the project

Traffic information should describe current volumes and expected volumes since many projects involve adding capacity to reduce congestion while other projects add new access points. Understanding whether VMT is increasing or decreasing, or how a project would change the mix of vehicles on the road will assist in judging the project's air quality impacts. For example, increased VMT associated with a new project is an important consideration in areas with a fugitive dust problem while increased congestion may be more relevant in areas where tailpipe emissions from diesel engines are the main PM-10 source. Traffic discussions should also describe any speed changes that may result from the project since emission estimates are very sensitive to vehicle speed. The speed and volume estimating method should be included. Additionally, the "fleet" or "vehicle profile" describing the types and percentages of vehicles likely to use the project will provide important information when considering the contribution.

C. Meteorology, seasonal and climate information for area

Meteorology is a major influence on air pollution problems. Temperature, amount of precipitation, seasonal and other weather conditions are also influences that should be discussed. When performing a qualitative analysis for PM-10, care should be taken to separate the PM emissions related to windblown or fugitive dust from emissions due directly from the project.

D. Location of monitoring stations

Discussing the location of monitoring stations could also be useful since determining a project's proximity to a monitor can help establish its influence. In addition to the project, there may be other sources of PM generated near the monitor such as a power plant, airport, or bus terminal that generate emissions not directly related to the project.

E. Miscellaneous information

Miscellaneous influencing factors could be whether the area has paved or unpaved shoulders, the number of unpaved roads, and whether roads are salted or sanded during winter storm events. Care should be taken to separate on-road sources of PM emissions from other sources including agricultural fields, industrial factories, and power generation plants. Also any on-road mobile source emission control programs and TCMs that will influence the emission concentrations for the area should be discussed.

3. Mitigation Practices

In addition to describing the project's potential for creating an emission problem, the qualitative analysis process can provide a list of operational practices that could be implemented to mitigate or offset any PM problem from the project that may be found to occur at a later time. A table including a menu of options is included below, however, many others may be possible. The options list is divided into solutions based on the suspected cause of the pollution although there may be other causes and solutions that are available.

Options to Reduce Particulate Matter Pollution

Suspected Source of PM10 Problem	Options to Reduce PM Pollution	
	Mitigation Measure	Comments
Fugitive Dust	Truck Cover Laws	may require greater enforcement effort in some areas
	Street cleaning program	includes vacuuming and flushing
	Site watering program	regular program will reduce dust
	Street and shoulder paving; Runoff and erosion control	should reduce significant quantities of dust material
Snow and Ice Control	Reduce the quantity of sand	use harder material that is not prone to grinding into finer particles or additional chemical treatments
Diesel Emissions from a Bus Terminal Expansion	Purchase a significant number of natural gas buses	cleaner buses will reduce localized PM-10 emissions for these types of transit projects
Diesel Emissions	Require PM diesel "traps" on diesel exhaust systems	traps or filters can substantially reduce PM-10 emissions; programs providing financial support available
Vehicle Emissions	Provide a "retrofit" program for older, higher emitting vehicles	could be used on bus fleets to install newer engines or technologies known to have lower emissions

Qualitative Estimation Techniques

The following list of techniques is not exhaustive and does not imply any order of priority. The specific technique used, whether one of those below or an alternative method, should be selected and documented through the interagency consultation process or through the NEPA scoping and public involvement process.

Depending on the outcome of a qualitative analysis, some areas may choose to supplement their findings with a more technical or quantitative approach that may contribute to a better understanding of the project's PM-10 effects. In any case, the interagency process should be used to determine the approach and method for analyzing the PM-10 effects of a project.

In general, qualitative methods can be categorized into the following approaches:

1. Comparison to another location with similar characteristics

   This method is probably one of the easiest approaches to demonstrating that a new project will not create a PM violation. It involves reviewing similar projects constructed in the past and built in close proximity to the proposed project. Sponsors should consult with air agencies for available information from previous work which could be used to support the new project's impact, if this work is still applicable.

2. Findings from air quality studies

   The SIP for an area contains a tremendous amount of information on air quality conditions in nonattainment and maintenance areas. This may include monitoring data and modeling data. The SIP also contains specific information on an area's air quality standards and goals. The SIP is an important tool to be referenced when conducting qualitative analyses for PM-10.

   It may be possible that some organization such as a State or local air agency or a university has also performed an air quality study in the local area of the proposed project. If these studies are available, they could be cited in the documentation indicating the expected air quality impacts of the proposed project. Some examples for conducting PM-10 qualitative analysis follow.

Example A: Project Which Does Not Increase VMT

A qualitative analysis was conducted for the addition of an acceleration/deceleration lane in a PM-10 nonattainment area, and re-entrained road dust is the primary source of PM-10 emissions. VMT was not expected to increase because no capacity expansion was planned for the roadway segments on either end of the project. Because VMT would not increase, and therefore fugitive PM-10 emissions from road dust are not expected to increase, the interagency consultation team concluded that there would be no impact on PM-10 emissions or concentrations, and no further analysis was needed.

Example B: Project Which Reduces Idling Emissions

The project in question involves modification of an intersection to include continuous right turn lanes in an area where idling emissions are the primary source of PM-10 emissions. While the movement improvements at the intersection would provide a slight increase in capacity, they would also reduce overall idling time at the intersection by 25 percent. The reduction in idling time would reduce idle emissions of PM-10, thus providing an overall air quality benefit. (This may also prove true for a project that converted a signalized intersection into an interchange.)

Example C: Comparison of New Project to Similar Project in the SIP

A qualitative analysis was conducted for a new freeway interchange at the edge of the urban area. This interchange would lead to VMT increases from both additional travel on the new connecting road, and from development planned for the vicinity of the interchange.

The area in question has a PM-10 maintenance plan that includes a modeled demonstration of maintenance extending out to the year 2015. The interagency consultation team decided to evaluate the new interchange by comparing it to an existing interchange that is within the PM-10 maintenance plan's modeling domain. The team located a similar interchange that was located near the edge of the urban area, and that also had higher traffic volumes and more intensive surrounding development than that expected at the new interchange. This interchange was within a maintenance plan modeling grid that was predicted to experience PM-10 concentrations of approximately 110 micrograms per cubic meter (the PM-10 standard is 150 micrograms per cubic meter). Since this existing interchange was not predicted to experience violations of the PM-10 standard, and the new interchange would see lower traffic volumes and less development, the team concluded that the new interchange would not be likely to experience violations of the PM-10 standard.

Example D: Comparison of Project Impacts to SIP Modeling

A qualitative analysis was conducted for a major freeway interchange reconfiguration in a suburban location. The region's travel model showed that the reconfigured interchange would experience approximately a 20 percent traffic volume increase over the existing configuration, both because of travel time savings and because the modified interchange would provide access to a new regional mall.

The interagency consultation team decided to evaluate the new interchange by calculating emission levels within the interchange's modeling grid, and comparing them to one of the existing SIP's modeling grids. According to the PM-10 SIP, the grid with the highest emissions levels in the metropolitan area had a modeled concentration of 149.9 micrograms per cubic meter, just below the 150 micrograms per cubic meter PM-10 standard, and had PM-10 emissions in the attainment year of 1.5 tons per day. The team reasoned that, if the grid with the reconfigured interchange were to have emissions of less than 1.5 tons per day, it could also be expected to remain in compliance with the PM-10 standard.

The team located the attainment year emissions estimate for the interchange's grid in the PM-10 SIP document, and then added the emissions expected to result from the increased traffic volumes at the interchange as well as the new regional mall. The resulting total was 1.1 tons per day, well below the 1.5 tons per day in the high grid of the PM-10 SIP's attainment demonstration. Thus, the team concluded that the reconfigured interchange would not experience violations of the PM10 standard.

Example E: Determination of Screening Threshold for Multiple Projects

The State DOT anticipated a large number of new interchange and other projects that would require a PM-10 qualitative analysis in the next few years. The primary source of the area's emissions is from fugitive dust. Rather than convening the interagency consultation team for each individual project, the team agreed that it would be the most efficient use of their resources to develop a screening threshold to which individual projects could be compared. Projects below a certain threshold could proceed without further analysis, while projects that exceeded the threshold would trigger the full review process.

The State DOT retained a consultant to conduct an air quality analysis of some candidate projects. After discussing the situation with the team, it was decided that the best approach would be to determine the largest project that could be constructed without triggering a violation of the PM-10 standard. The consultant conducted an air quality modeling exercise, using typical project configurations and the highest background values typically experienced in the metropolitan area, and concluded that a project would have to generate 500,000 daily VMT within a one-square-mile area in order to cause a potential violation of the PM-10 standard. The vast majority of the projects contemplated by the State DOT fell well below this threshold, and were able to proceed without further analysis (the project documents simply referenced the study

and provided project-specific traffic volumes for comparison). The few projects that were over the threshold received a project-level review by the interagency consultation team, and they were designed to include mitigation measures to reduce road dust emissions so that they fell below the emissions levels modeled in the screening study. (The mitigation measures varied by project, but they included steps to reduce soil erosion from landscaped areas, street sweeping on the approach arterials, and use of liquid deicers, which also served to protect the project bridges from corrosion.)

Example F: Comparison of the Project to Another Site Based on Monitoring Data

The project entails a modification to an interchange connecting a primary route to an interstate. The area is a nonattainment area for PM-10. It is a suburban portion of a larger metropolitan city.

A meeting was held to assess the PM-10 impacts considered likely to result from the project and included members from the MPO, FHWA, EPA, State DOT and State Air Quality Agency. This group assessed the project in several areas and concluded that PM-10 was not going to be a problem. In making this determination, several factors were considered including the existing conditions, traffic volume changes, meteorology, location and monitoring stations, and monitored concentration levels. They found the following:

Currently, PM is not a problem at this project site. Members of the interagency council reviewed information supplied by State Air Quality Agency and found the project area did not have any problems with PM-10. Information supplied to this group by the State Air Agency also noted that PM-10 emissions were shown to be decreasing at the project site.

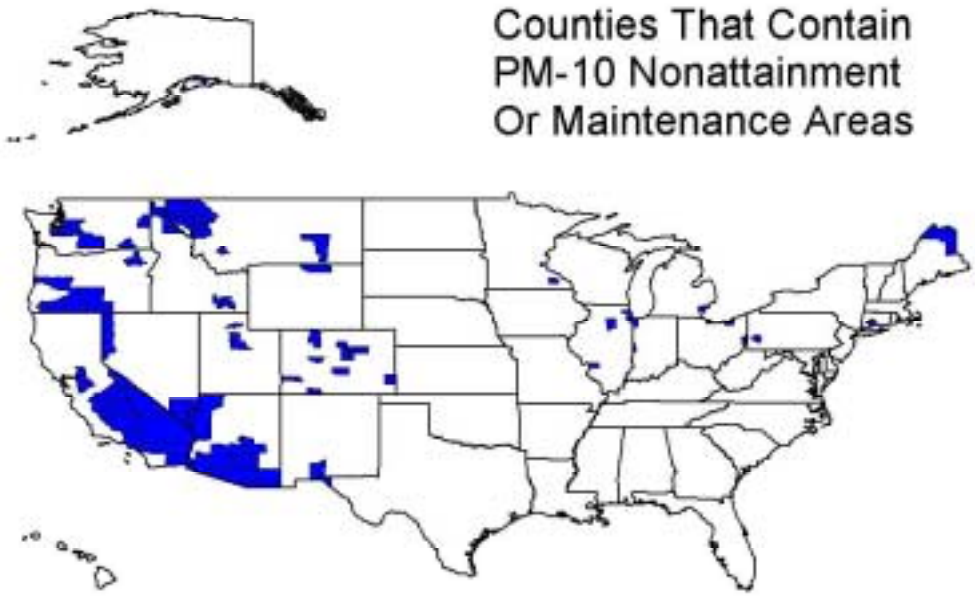
The traffic change resulting from the project has been estimated. This estimate was provided by the State DOT and was found to be consistent with VMT increases in the metropolitan area generally where no increase in PM emissions or concentrations have been noted.

The meteorology at Project X can generally be categorized as variable, the wind varies during the day. There is often some wind which acts to disperse PM emissions at the site. There does not seem to be any noticeable dust contained in the wind. Temperature, humidity, and rainfall do not seem to influence the level of PM pollution at this site.

A monitoring station close by has not registered any violations, and through the consultation process, it was determined that VMT increases from the project would not result in a new violation.

Thus, it would appear that the concentrations of PM at this site on a daily basis are currently within the standards and that future emissions that may result from this project will be low enough that they will not introduce a PM problem.

Figure 1



Source: EPA Greenbook: Nonattainment Areas for Criteria Pollutants, January 29, 2001, www.epa.gov/oar/oaqps/greenbk/index.html